

# HEALTH IN FIFTEENTH-CENTURY ANATOLIA: A PRELIMINARY TEXTUAL ANALYSIS BASED ON THE WORKS OF AMIRDOVLAT<sup>1</sup> AMASIATS'I

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## A BRIEF OVERVIEW OF ARMENIAN MEDICINE

The original sources of Armenian medicine—Caucasian, Sumerian, Babylonian-Assyrian, Urartian, Persian, and Armenian proper—cannot be, as far as I know, elucidated. Some old pharmacopeial terms subsists in the medical literature, vaguely alluding to a specific medical tradition in that part of the world.<sup>1</sup> Nevertheless, the remarkable floral, faunal, and mineral richness of the region and the accessibility of a number of written medical traditions—from the Sumerian to the Greco-Arabic—suggest a number of avenues for future investigations.

The historical veil gets more transparent after the invention of the Armenian alphabet. Eznik of Kolb, in an otherwise religious and polemic text,<sup>2</sup> mentions a number of medical concepts and practices in fifth-century Armenia. Eznik's basic pathological concepts derive from Galen.<sup>3</sup> There is an additional notion, that of self-inflicted pathologies—therefore, preventable ones—the consequences of “*i shat utēloy ew hēmpēloy lini, kam i sastik pahots’, kam ankhitit kērakrots’, kam hoyzh i tōt’ ashkhatēloy, kam kari i ts’rtoy llkēloy*. These diseases obviously fall under three categories: due to “depraved,” “virtuous,” and “uncontrollable” excesses, respectively.

Eznik cites a number of medicinal plants,<sup>4</sup> mentioning some of their therapeutic effects as well. Medicines obtained from animals are also cited.<sup>5</sup> With respect to mental illness, Eznik recognizes “*ts’awk’ or vasn meghats’ linin, ew . . . inch’ tsawk’ or och’ vasn meghats’*,” announcing the modern dichotomy between physical and mental self-inflicted and non-self-inflicted pathologies. In the mental realm, Eznik's distinction evokes the modern dichotomy between neuroses and

<sup>1</sup> The versatile Armenian bole is one of them: A friable clay containing silicates of aluminum and magnesium, with iron oxide imparting it a red color. It was used as medicine, coloring material, in bookbinding and gilding, or even in the preparation of jewelry. As a medicament it was used internally as an astringent, to control diarrhea and gastro-intestinal hemorrhage. Externally, it could be used as a salve to prevent ulceration, or to help heal bone fractures and joint dislocations.

<sup>2</sup> Eznik, *Eghits aghandots'* (Buenos Aires: Tp. “Ararat,” 1951) and Eznik, *Eznkay Koghbats’woy Bagrewanday Episkoposi Eghits aghandots'* (Venice: I Srboyn Ghazar, 1826). Henceforth Eznik 1 and Eznik 2.

<sup>3</sup> “*Martoy marmin i ch’orits’ tarērn khařneal ē . . . i khonawut’enē, i ts’amak’ut’enē, i ts’rtut’enē ew i jermut’enē, ew t’ē mi inch’ pakasits’ē kam holovits’ē, ts’aws gortsē i marmnin.*”

<sup>4</sup> Cannabis sativa L., Cannabaceae; Conium maculatum L., or Cicuta virosa L., Umbelliferae; Euphorbia Apios L., or E. amygdaloïdes L., Euphorbiaceae; lettuces (various spellings); Mandragora officinarum L., Solanaceae.

<sup>5</sup> Eznik 1, pp. 31-32.

psychosis; or, rather, mental pathologies we can attempt to correct with changes in behavior and those that can only be cured with modern neurotropic drugs.

The evolution of medicine between the eleventh century and the fifteenth century is much better documented—from Grigor Magistros to Amirdovlat‘ Amasiats‘i.<sup>6</sup> Texts begin to be written in the vernacular, objectivity and originality are the hallmarks of the authors of the period,<sup>7</sup> with perceptions of novel pathological concepts,<sup>8</sup> and scientific methodologies (e.g., the performance of human dissections in medieval Armeno-Cilicia).

Over time, a certain continuity in Armenian medicine is evident, as attested, for example, when Eznik is compared to Amirdovlat‘—the former recognizing the Cannabis as a “reducer of [sexual] desire,”<sup>9</sup> and the latter stating, some ten centuries later, that it “diminishes the number of seeds,” i.e., spermatozoa.<sup>10</sup>

## ARMENIAN MEDICINE—AN EVOLVING CULTURAL ENTITY

I am going to present and discuss a randomly chosen term (*as-sarsâm*, in Arabic; and *sarsam* in Armenian). Some modern translators think that this word means “meningitis.” Linguistically, the word simply means stupefaction and unconsciousness. In the vernacular (as in the Turkish *sersem*) it means imbecility.

Ignoring the difficulties in reconciling the meaning of medieval and modern medical terms, Table I compares the descriptions of “meningitis” of a ninth-century Arab physician (ar-Râzî) to that of a seventeenth-century Armenian practitioner (Buniat‘ Sebastats‘i). One can appreciate that the latter description is richer in its descriptive symptomatology, indicating that medicine had progressed during the intervening centuries, and that Armenian physicians kept abreast of such changes. The Armenian author presents a more complex differential diagnosis and more specific signs and symptoms (e.g., photophobia, “heavy head,” suggestive of stiff neck; speech problems; memory loss; and stupor).<sup>11</sup>

## HEALTH IN FIFTEENTH-CENTURY ARMENIA/ANATOLIA

In the modern world, clinical epidemiological knowledge and the analysis of pertinent medical-historical data combine to give a good idea of specific pathol-

<sup>6</sup> Paul Bellier, “Médecine et médecins Arméniens entre le XI<sup>e</sup> et le XV<sup>e</sup> siècle,” in *L’Arménie et Byzance: Histoire et Culture* (Paris: Centre de Recherches d’Histoire et de Civilisation Byzantines, 1996), pp. 31-36.

<sup>7</sup> Mkhitar Herats‘i and Amirdovlat‘ emit opinions against the dogmas of the day (e.g., on the limitation of bloodletting, or the reality of same medicinal attributions to specific plants).

<sup>8</sup> The recognition that some fevers may be of external (infectious) origin.

<sup>9</sup> EznikI, pp. 31-32.

<sup>10</sup> Amirdovlat‘ Amasiats‘i, *Angitats‘ anpet kam bařaran bzhshkakan niwt‘ots‘*, ed. K.H. Basmajean (Vienna: Mkhitaran Tparan, 1926), p. 295, § 1741. Hereafter “Basmajian.”

<sup>11</sup> Surprisingly, headache and vomiting are absent from both descriptions and nuchal rigidity is not explicitly mentioned. It seems that the ancient term connotes a more diffuse and ill-defined pathology (in modern terms) that affects the brain and its membranous envelopes.

ogies, their geographic distribution, and their relative frequencies in a defined population. Such tools were obviously not available in the past and cannot be generated today *post facto*.

We therefore need to come up with novel methodologies, that would provide some estimate of the prevalence<sup>12</sup> of diseases of specific organs (e.g., the eye and the ophthalmic pathologies) in a specified population at a given time period. The following sections will present proposed new approaches to achieve our objective.

## THE EPIDEMIOLOGICAL APPROACH

### Modern Observational Epidemiology

When studying a specific pathologic sign or symptom (e.g., cough, pain, or loss of hair), contemporary epidemiologists use the following equation to estimate its frequency in a given population:

$$F_e = N_e/T \quad (\text{Equation 1})$$

Where  $F_e$  represent the estimated frequency of a specific type of *event*,  $N_e$  the total number of people suffering from that event,  $T$  the total number of people in the studied population

It may be difficult, if not impossible, to determine the exact value of  $T$ . Several approaches are available to estimate it rather than actually measure it. One of them assumes that the total number of all the recorded pathological signs or symptoms in the studied population is proportional to the total number of people.

This last assumption can be expressed as follows:

$$T = k \cdot S_e \quad (\text{Equation 2})$$

Where  $S_e$  is the total number of all recorded events and  $k$  a constant

Equation 1 can now be rewritten (assuming that  $k=1$ ):

$$F_e = N_e/S_e \quad (\text{Equation 3})$$

### The Proposed Novel Approach

I will now change the terms of Equation 3 as follows:

$$F_s = N_s/S_s \quad (\text{Equation 4})$$

<sup>12</sup> The prevalence of a disease is the ratio of the number of those presenting the disease at a specified time and the total number of individuals in the population at that time. It is usually expressed as a percent of the total population.

Where  $F_s$  represents the estimated frequency of a specific pathological *sign or symptom* in the monumental treatise of simples of Amirdovlat' Amasiats'i.<sup>13</sup>

$N_e$  is the total number of citations of that specific event in Amirdovlat'’s opus,  $S_e$  is the total number of citations of all signs or symptoms in that same opus.

Equation 4 is only concerned with signs and symptoms; thus, it avoids the uncertainties related to the difficulty of identifying, according to modern terminology, any specific disease or disease category alluded to by Amirdovlat' and, indeed, in the entire medical literature preceding the modern period. Signs and symptoms are unambiguous while, as we have seen above in the case of the disease term meningitis, such specific pathological terms present philological problems that are almost impossible to resolve in most cases.

To illustrate our approach with clarity, I am going to adopt a further simplification, i.e., only ocular signs and symptoms will be utilized. Even then philological difficulties persist and a determined effort must be made to understand the meaning of Amirdovlat'’s ophthalmologic vocabulary (see Appendix I).<sup>14</sup>

### **Limitations of Both Epidemiological Approaches**

Equation 4 presents two kinds of weaknesses, based on the basic assumptions it contains:

1. It participates in the limitations of Equation 3, inasmuch as the total number of the population where a specific event ( $S_e$ ) has been observed, is estimated rather than being measured. In the past, this assumption has been validated in a number of instances, by comparing the obtained results with more rigorous experimental epidemiological studies where the total number of events could be actually measured.
2. It has further limitations of its own, since it assumes equivalence between  $S_e$  and  $S_s$ , while it imposes an additional simplification by taking  $k$  to be equal to 1.

The eventual consequences of these assumptions can be very difficult to detect and correct. Nevertheless, though our data and conclusions will be estimates, they still remain valuable since nothing else is available at present. We may also be able to develop, as we proceed, unexpected ways to judge the general validity of our results.

### **Compilation and Analysis of Signs/Symptoms Citations**

I will now illustrate the proposed epidemiological approach by studying all the terms in the Amirdovlat' opus that unequivocally refer to signs and symptoms of

<sup>13</sup> Basmajian.

<sup>14</sup> The remarkable critical apparatus in Basmadjian has been extremely helpful in this particular endeavor, as in so many others.

the eye. The eye was chosen for four reasons: one, the manageable size of the database; two, the availability of medical geographic knowledge; three, the social importance of eye diseases, since they may lead to blindness; and four, Amir-dovlat's specialization in medical and surgical ophthalmology.

## OCULAR DISEASES IN FIFTEENTH-CENTURY ANATOLIA

### Cataract

Apparently, cataract was the most common ocular disease in fifteenth-century Armenia. Its frequency is measured by the following equation:

$$F_d = (N_d/N_t) * 100 = 22.5\% \quad (\text{Equation 5})$$

Where  $F_d$  represents the frequency of cataract among all eye diseases;  $N_d$ , the total number of citations of cataract, i.e., 146;  $N_t$ , the total numbers of citation for all eye diseases, i.e., 648.

The next equation represents the prevalence<sup>15</sup> of cataract in the general population:

$$P_d = (N_d/N_t) * 100 = 0.9\% \quad (\text{Equation 6})$$

Where  $P_d$  represents the prevalence of cataract among the population;  $N_d$ , the total number of citations of cataract, i.e., 146;  $N_t$ , the total numbers of citation for all diseases, i.e., 15,654.

According to the Research Center to Prevent Blindness of the National Science Foundation, the prevalence of cataract in the United States is 2.0%. Assuming that all things are otherwise equal, the difference between 0.9% (the estimated prevalence in fifteenth-century Anatolia) and 2.0% (the prevalence in a modern Western country) is explicable by the fact that medieval Armenians had a shorter average lifespan and that cataract is more frequent in older age groups. Thus, one would expect a higher prevalence in a population that lives longer. In any event, the two figures (0.9% and 2.0%) are close enough and their difference is as expected based on the different lifespan of the populations living in different time periods. These results seem to provide a first validation of our epidemiological approach.

### Trachoma

Trachoma is caused by the bacterium *Chlamydia trachomatis*. The infectious agent attacks then invades the cornea. It causes scarring and deformities that may lead to blindness; thus, it is a serious and debilitating disease. It should also be noted that vitamin A deficiency, particularly in infancy, lowers the resistance to the infection.

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<sup>15</sup> The prevalence of a disease is the percent of the total population suffering from that disease at any time point.

The following quotations concerning trachoma are extracted from a history of world diseases: "Trachoma, due to bacterial conjunctivitis, has been described in Turkey (especially in its southeast steppe area) and in Iran (south of Isfahan, in particular, where a large Armenian community was established during the early seventeenth century)."<sup>16</sup>

Using Equation 6 and the number of citations in Amirdovlat<sup>1</sup> for trachoma ( $N=4$ ), we can calculate the prevalence of trachoma among medieval Armenians to be equal to 0.026%, affecting 1 in roughly 3,900 individuals. In every million people, 256 individuals would be affected by trachoma. This does not appear to be a very heavy burden and would tend to support our contention<sup>17</sup> that, in times of peace, sufficient food (in terms of quantity and quality) was available to the general population. Thus, one would expect a healthy diet with sufficient amount of vitamin A being available to the populations, allowing them to be relatively resistant to trachoma.

### Xerophthalmia/Hemeralopia/Nyctalopia

Vitamin A deficiency may cause xerophthalmia,<sup>18</sup> hemeralopia,<sup>19</sup> and nyctalopia.<sup>20</sup> There are two citations from Amirdovlat<sup>1</sup> for these interconnected diseases. We can then determine the prevalence of the condition (0.013). The condition would affect 1 in roughly 7,700 individuals. In every million people, 130 individuals would suffer from the pathologies that follow severe A avitaminosis—again, not an excessive burden.

There was in medieval Armenia a population particularly sensitive to this condition: the monks, and particularly those who went well beyond the already rigorous Armenian fasting habits. The language has retained the name *abeghchash* to record what monastery food was at its best: a soupy preparation from crushed nuts, garlic, and vinegar eaten with bread soaked in it.<sup>21</sup>

I have described, in its time,<sup>22</sup> the case of Momik—genial scribe, miniaturist, sculptor, and architect of the Orbelian princes—who in a colophon<sup>23</sup> “[written by] the sinful, the ignorant, and the worthless scribe,” stated that “[in A.D.

<sup>16</sup> Kenneth F Kipple, ed., *The Cambridge World History of Human Diseases* (New York: Cambridge University Press, 1993), pp. 453-462.

<sup>17</sup> John L. Guerigian, “Foods and Drinks in Fifteenth-Century Anatolia,” *Journal of the Society for Armenian Studies* 14 (2005), pp. 155-166; John L. Guerigian, “Foods, Beverages, Recipes, and the Nutritional and Health Status of Fifteenth-Century Armenians,” *Armenian Medical Review* 1 (2005), pp. 32-35.

<sup>18</sup> An abnormal dryness, then thickening of the conjunctiva and the cornea.

<sup>19</sup> Day blindness.

<sup>20</sup> Night blindness.

<sup>21</sup> St. Malkhaseants’, *Hayerēn bats’atrakan bařaran, hator arājin* (Erevan: Haykakan SSR Petakan Hratarakch’ut’iwn, 1943), p. 2.

<sup>22</sup> John L. Guerigian, “Some Insights into the Orbelian principality of Siunik. Part I: Scholars and Patrons,” *Journal of Armenian Studies* II, no 2 (Fall/Winter 1985-1986), pp. 27-28.

<sup>23</sup> Hartford Seminary Foundation Arm. 3, Four Gospels, A.D. 1307-1331, in Avedis K. Sanjian, *A Catalogue of Medieval Armenian Manuscripts in the United States* (Berkeley, Los Angeles, and London: University of California Press, 1976), pp. 81-89.

1307], I wasn't able to" finish the copying of the manuscript "due to the weakness of my sight. . . . [But] after a few years, the light of my eyes was restored to me in [A.D. 1331]."<sup>24</sup> Upon studying this intriguing condition, I found out the following: one, that Momik was copying the manuscript, *à la lumière d'une chandelle*,<sup>25</sup> in the dark scriptorium located on the ground floor of Noravank<sup>6</sup> of Amagh; and two that, during that same period of "eye weakness," he was nevertheless able to go out in the sun and carve *khachkars* and build churches. It is thus probable that his diet was deficient in Vitamin A. As a result, he couldn't see inside the dark scriptorium (nyctalopia), but he was able to sculpt and build in the open air. It may also be that, between 1307 and 1311, his diet improved with respect to Vitamin A content.

## PARAMETERS AFFECTING PUBLIC HEALTH IN LATE MEDIEVAL ANATOLIA

### Doctor-Patient Interactions

We may take Amirdovlat's relationship with his patient as paradigmatic of the times. We know, from the available documents, that he was an army surgeon—accompanying Mehmet II in his campaigns—and he also had a practice when back in his town of principal residence, i.e., the just conquered Constantinople. His familiarity with many languages make it probable that all ethnic groups were open to his practice, while one would also expect that he devoted a large portion of his time to his compatriots living in the Armenian quarters (*mahallât*) of Constantinople.

The following quotes from ms. 247, housed in the Bibliothèque Nationale (Oriental Section) in Paris,<sup>26</sup> add to our understanding of doctor-patient relationships in fifteenth-century Armenia and in other areas inhabited by Armenians:

1. "When you approach the sick, hold his right hand to take his pulse and utter: 'Naption, Kappa and Milon.'"<sup>27</sup> These cabalistic words of introduction were meant to reassure the patients by making them believe that the practitioner possessed certain magical powers. This intent is also illustrated by the generous use of talismans by the sick, the traveler, and those in danger, while Amirdovlat himself was a maker of such reassuring objects.
2. "Observe the patient's signs: If you see a dark veil on his brow, the patient is dying. . . . It behooves the doctor, when he approaches the sick, to

<sup>24</sup> Guerigian, "Some Insights," p. 28.

<sup>25</sup> By the light of a candle. I recently visited that scriptorium and found it to be dark even on a sunny day.

<sup>26</sup> Amirdovlat' Amasiats'i: *Vasn nshanats' hiwandin, zkenats' ew zmahun, char ahpashi ēramatanin arraeal, or ē Amirtolvat'*, bzhishkn Amasiats'i (Of the Patients' Signs of Life and Death); henceforth, "Vasn nshanats'."

<sup>27</sup> *Vasn nshanats'*, 64v (author's translation).

determine . . . the good and the bad [of the situation], since the doctor cannot cure all diseases. . . . And [the physician] Bagarat said that a doctor could cure all ills but he himself died [i.e., couldn't save himself]. It behooves the physician to help the patient's nature, since helping nature is useful and may cure the illness. If the physician cannot help nature, he cannot accomplish anything.”<sup>28</sup> A century later, the French physician Ambroise Paré would echo Amirdovlat’s sensible statement, saying: “*Je l’ai pansé, Dieu l’a guérit,*”<sup>29</sup> except that for Amirdovlat’ it is Nature that heals.

3. “He whose eyes are blue [*khazh*] and small [*p’ok’r*] tells tall stories [*vayrakhōs*] and is long-winded [*shatasats’*]. He whose eyes are black [*sew*] is . . . valorous [*k’ajaban*]. He whose eyes are charmingly [*patarakn*] large [*ardzak*] acts, in all circumstances, in a gentle [*meghmaban*] way. He whose eyes are narrow [*negh*] and small [*p’ok’r*] loves wine [*ginarb*], is an alcoholic [*ginēsēr*], and a keeper of prostitutes [*bozarats*]. He whose eyes are sweet [*meghush*] has a good reputation [*aghēk ē bark’n*] and is peaceful [*khrovktor*]. He whose eyes are blue and shining is bold in his malfeasance [*hamardzak ē i ch’arut’iwn*]. Dark-colored [*mt’agoyn*] eyes indicate a voluptuous [*bghjakhoh*] person. Blackish [*t’ukh*] and bloodshot [*karmragoyn*] eyes belong to a person wicked [*ch’ar*] as a beast [*gazan*]. A shifty [*kokun*] eye indicates an insecure [*anhastat*] person. The absent-looking eye [*dataräkn*] speaks nonsense [*vayrakhōs*] and is young [*chēhil*]. Small and bluish eyes indicate a wine-lover and a keeper of prostitutes.<sup>30</sup>

Some fifty years before Amirdovlat’, Grigor Tatewats’i asked himself if physiognomic traits could indicate a man’s character.<sup>31</sup> He stated that they could not. Amirdovlat’ seems to disagree with that statement and uses appearances to judge the character of his patients and its consequences on their behavior and their health.

Amirdovlat’s description of eye characteristics (and their relationship to behavioral traits descriptions) fall under three categories:

1. The black and large eyes, belonging to the valorous, the charming, the peaceful, and the sweet;
2. The small, narrow, and dark eyes, belonging to individuals who are wine-loving, wicked as beasts, and keepers of prostitutes;
3. The blue eyes belonging to those who tell tall stories, are long-winded, bold, and cruel.

<sup>28</sup> Ibid., 65r.

<sup>29</sup> I mended him, God healed him.

<sup>30</sup> Ibid., 69v.

<sup>31</sup> In S. Vartanyan, *Bzhshkut’yunē hin ev mijnadaryan Hayastanum* (Medical Practice in Old and Medieval Armenia) (Erevan: “Sovetakan Grogh” Hratarakch’ut’yun, 1982), p. 39.

There is here more than meets the eye, so to speak. This quotation seems to contain a cultural message as to which physical traits are desirable as opposed to those that are undesirable. One could speculate that the first type describes Armenians; the second, foreigners from the East; and the third, foreigners from the West. If so, this cultural message (a Lamarckian trait since it can be transmitted from one generation to another) may, if effectively practiced for long periods of time, influence reproductive choices to select and retain (in Darwinian fashion) the desirable traits in the population, while rejecting the undesirable ones. Further, the desirable physical traits are to be retained because of the favorable behavioral characteristics that accompany them.

## CONCLUSIONS

The health of any population is predicated on the availability and accessibility of foods and beverages to fulfill its nutritional needs. In a previous publication, I concluded as follows: "The diet of Anatolians in those days is surprisingly diverse and varied. In that sense, it is more conducive to good health than our modern eating habits."<sup>32</sup> That particular enquiry showed that nutritious foods and beverages were available to all classes of the populations, at least during periods of political stability—barring the occasional natural disaster.

In another recent effort,<sup>33</sup> I tentatively arrived at the following conclusions:

1. Our ancestors' general health was negatively affected by their inability to effectively correct the main pathologies afflicting them: infectious and parasitic diseases; various degenerative disorders of old age (e.g., heart, liver, kidney, bone, and joint conditions); aggressions by dangerous insects, reptilians, and mammals; and various tumors (benign and malignant).
2. All these essentially uncontrolled diseases must have resulted in a higher level of infant mortality and an overall reduction in average lifespan.
3. Those disadvantages were mitigated by the following:
  - a. Pain was better tolerated and, when intense, could be treated with opiates;
  - b. Survival beyond the first five years of life was, in effect, a natural selection process;
  - c. The populations were, in majority, physically active and reasonably well fed.
4. On balance, fifteenth-century individuals paid a high price to disease but society at large benefited from a relative stable genome, since those suffering from grievous and genetically transmissible conditions could rarely bear progeny.

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<sup>32</sup> Gueriguian, "Foods and Drinks in Fifteenth-Century Anatolia," p. 165.

<sup>33</sup> Gueriguian, "Foods, Beverages, Recipes."

In the present work, I introduced some novel approaches to determine the major pathologies affecting the general population and to estimate their prevalence and the consequences that they would have on the general health. A proposed epidemiological approach was illustrated by an in-depth study of the ocular pathologies and its results validated in preliminary fashion. Our conclusion, at present, is that the prevalence of cataract, trachoma, and other eye diseases do not seem excessive and, therefore, that blindness didn't significantly affect society. The low prevalence of "night blindness" seems to indicate that the populations had a good intake of vitamin A and, by implication, of other lipid-soluble vitamins.

Another important conclusion is suggested when one compares the estimated prevalence of cataract among medieval Armenians (0.9%) to today's Americans (2.0%), presumably due to the difference in average lifespan between the two populations. The present health crisis in the modern world—as illustrated by "heroic" end-of-life medical practices and the shaky economics of modern health services—show that a longer average lifespan is not always an advantage, to individuals as well as to society, since it would seem that the prevalence of most degenerative diseases may be lower in old, as opposed to modern, societies. Finally, the study of an as yet unpublished medieval medical opus by Amirdovlat' uncovered an interesting possibility: That, consciously or unwittingly, Armenian community leaders may have been affecting, through education, the reproductive choices of their people, in the hope that the retention of desired physical traits (and rejection of alien traits) would lead to continued socially beneficial behavior.

ROCKVILLE, MARYLAND

## APPENDIX I: A LEXICON OF AMIRDOVLAT'S OPHTHALMOLOGICAL TERMS

<i>Ach'ats'</i>	of the eyes, from the eyes.
<i>ayril</i>	prickling, smarting of the eyes.
<i>astar'</i>	cornea, the transparent structure forming the anterior part of the eye.
<i>ariwn</i>	literally, bloody eyes; perhaps also ophthalmorrhagia (hemorrhage from the eye) or ophthalmorrhea (oozing of blood from the eye).
<i>artasuk'</i>	tears.
<i>arts'uel</i>	produce or induce watery eyes.
<i>k'al</i>	nyctalopia, night blindness, failure or imperfection of sight in dim light or at night
<i>bolori sewut'iwn</i>	dark shadows around the eyes, chronic darkening of the eyelids, as seen, e.g., in exophthalmic goiter.
<i>bor</i>	infection or inflammation of the eye.
<i>borbos</i>	catarrh of the eye, i.e., inflammation with a watery or purulent discharge.
<i>gichut'iwn</i>	moistness of the eye, either as meant in the context of the humoral theory, or in a literal sense (as in tearing eyes).
<i>degh</i>	medicine for the eye, collyrium.
<i>deghnut'iwn</i>	yellowing of the conjunctiva, due to jaundice.
<i>er̄k'</i>	sensation of extreme heat of the eye, due to inflammatory or other processes.
<i>zen ar̄nogh</i>	hurting the eye or the visual acuity
<i>ěghunk</i>	literally, nail of the eye; pterygium, a wing-like (or nail-shaped) structure of the eye, extending from the inner angle to the cornea.
<i>t'antsrut'iwn</i>	literally, thickening of various components of the eye.
<i>loys tal</i>	give brightness, sheen, twinkle to the eye; perhaps an expression signifying an overall improvement of health.
<i>khoshrut'iwn</i>	thickening of the eyelids.
<i>khostuk</i>	ophthalgia, eye pain, generally due to: 1. visible inflammatory changes of the eye (foreign body, ingrown lashes, conjunctivitis, etc.); 2. without changes in the eyeball but with acute visual loss (retrobulbar neuritis); 3. eyestrain or fatigue; 4. certain febrile conditions (influenza, small pox, typhus, typhoid fever, measles, malaria); 5. other causes (e.g., sinusitis).
<i>khots'</i>	sore or wound of the eye, inflammation of the eye usually due to conjunctivitis, rarely to keratitis (corneal inflammation) or, less even frequently, to iritis (inflammation of

	the interior of the eyeball). The agents of such diseases usually are: microbial, infections, trauma, trachoma, tuberculosis.
<i>kits</i>	smarting or stinging of the eye.
<i>ktsnal</i>	to cause a prickling or smarting of the eyes.
<i>kopi ijuatsk'</i>	ptosis; a drooping of the upper eyelid due to allergic conditions (angioneurotic edema), congenital defect, injury, trachoma, paralysis of the third nerve or the cervical sympathetic nerve.
<i>kopi ur̄ets'</i>	see <i>ach'ats' khoshrut'iwn</i> .
<i>safra</i>	yellowing of the conjunctiva, an early sign of jaundice, itself commonly caused by viral, microbial or cancerous diseases of the liver, gallstones, and specific parasitic infestations.
<i>spitak</i>	leukoma, i.e., a dense white opacity of the cornea, which is a scar following an infection (that often follows a trauma) of the eye. The condition results in visual impediment since the scarred portion is opaque. The term may also apply to the scarring of the eye due to trachoma, a chlamydial infection endemic in the Middle and Near East.
<i>srut'iwn</i>	visual acuity.
<i>vatuzhut'iwn</i>	weakness of the eye or loss of visual acuity, depending on context.
<i>tapaghay</i>	aqueous or vitreous (lens and vitreous body) humors of the eye.
<i>Ach'ats'aw</i>	pain in the eye, ophthalmalgia.
<i>hin</i>	old, long-standing, chronic ophthalmalgia, or pain in the eye.
<i>sur</i>	acute ophthalmalgia (pain in the eye).
<i>tak'</i>	catarrhal ophthalmalgia, or pain in the eye, one that is accompanied with a free discharge or excretion.
<i>Ach'ta'awut'iwn</i>	see <i>Ach'ats'aw</i> .
<i>Ach'its'</i>	of or for the eye; see <i>Ach'ats'</i> .
<i>mt'naln</i>	loss of eyesight, or visual acuity, due to ageing or disease.
<i>Ach'k'i</i>	of the eye; see also <i>Ach'ats'</i> .
<i>awēli maz ē busel</i>	literally: more hair is grown in the eye; probably, referring to the entropion (ingrown eyelashes), or to ectropion (inward inversion of the eyelids), with eventual pathologies due to the continuous scratching of the eye by the eyelids.
<i>zafra</i>	two interpretations are possible, depending on context: 1. ocular pterygium (winglike conjunctival encroachment onto the cornea); or, 2. leukoma of the eye due to bacterial or viral infections, e.g., trachoma.
<i>zafray</i>	see <i>Ach'k'i zafra</i> .

<i>int'ishar</i>	mydriasis (dilation of the pupil through a pathological or therapeutic process) from the Arabic Intishar.
<i>ijuatsk'</i>	probably hernia of the iris, protrusion of the iris through an abnormal opening (due, e.g., to a trauma or a wound) of the eye. May also mean ptosis (drooping of the upper eyelid), due to paralysis, trachoma, inflammation of the eye, and angioneurotic edema.
<i>khlt</i>	aqueous or vitreous (lens and vitreous body) humors of the eye. See also <i>Ach'ats' tapaghay</i> .
<i>khtut</i>	tickling or scratching sensation of the eye.
<i>tsaghik</i>	variolar (small-pox) eruptions on the eye.
<i>kaput</i>	literally, the blue of the eye; more probably bruising of the eye due to a trauma ("black eye").
<i>kaputkiln</i>	bruising of the eye.
<i>karmrut 'iwn</i>	literally, redness of the eye, i.e., an inflammatory process with vasodilation and redness; due to allergies, bacterial infections, trachoma, acute glaucoma, and iritis (diabetic, gouty, etc.).
<i>gharap</i>	tumor or swelling of the lachrymal gland; may be due to lachrymal calculus (stone) or neoplasm (benign or cancerous).
<i>ghisha</i>	cataract, opacity of the crystalline lens in the eye; more often due to ageing, diabetes, trauma of the eye, following glaucoma attacks, and in craftsmen exposed to high temperatures (e.g., glassblowers).
<i>ghishay</i>	see <i>Ach'ats' ghisha</i> .
<i>charap</i>	crust or scab covering the eye, due to an inflammatory process, usually shutting the eyelids. Alternatively, may also mean follicular iritis, marked by multiple small nodules the size of a pinhead.
<i>chipr</i>	sticky substance of the eye, usually denoting an early sign of an inflammatory process.
<i>mēj mis</i>	literally, "flesh in the eye"; chemosis (excessive edema of the conjunctiva of the eye) usually due to angioedema (with abdominal cramping and difficulty of breathing), allergic disorder, and acute (viral) conjunctivitis. The latter etiology may well be implied in this particular expression, which literally translates as "flesh in the eye."
<i>mēji khots'</i>	literally, "sore inside the eye," infection affecting the interior of the eyeball, i.e., iritis, perhaps including purulent iritis, in which the exudate is purulent, because (initially) the pus was inside the eye.
<i>mt'nal</i>	reduction or diminution of eyesight; may also mean lightheadedness, loss of consciousness.

<i>nasur</i>	egilops, perforating ulcer of the inner canthus of the eye.
<i>nerk'ewi t'arakhot urēts'</i>	literally, "pustular swelling of the inner canthus of the eye," i.e., dacryocistitis, inflammation of the lacrymal sac, variety during which purulent material is expressed; due to microbial or gonorrhreal (venereal) infection.
<i>shter</i>	may be interpreted in two ways: 1. either visual spots before the eyes; a subjective disturbance, usually caused by myopia and rarely due to uveitis, i.e., the vascular middle coat of the eye, comprising iris, ciliary body and choroid; or 2. small follicles or pustules on the conjunctiva, such as seen during trachoma, a viral infection endemic in the Middle and Near East see <i>Ach'ats' shter</i> .
<i>shtnkner urēts'</i>	inflammatory or, more rarely, cancerous tumors of the eye. May also imply exophthalmos, the prominent protrusion of one or both eyes, due to hyperthyroidism, orbital periostitis. xerophtalmia, dryness of the conjunctiva and cornea of the eye, due to vitamin A deficiency, or keraconjunctivitis sicca (a long-standing dryness of both eyes).
<i>ch'orut'iwn</i>	brightness of the eye, with an additional meaning: liveliness of the eye (referring to a sign of general good health).
<i>paytsarut'iwn</i>	eye pustula, or pustula of the eyelids, depending on context.
<i>pavasir</i>	hardening of the eyes, perhaps due to increased intraocular pressure, as seen, for example, in glaucoma.
<i>pntut'iwn</i>	literally, water descending in or added to the eye. In fact, cataract, i.e., opacity of the crystalline lens of the eye, which looks milky, evoking the blanching seen when water is added to clear anisette. see <i>Ach'ats' jur ijnel</i> .
<i>jur ijnel</i>	chalazion (eyelid mass due to the chronic inflammation of a Meibomian gland), or internal stye (due, usually, to an infection).
<i>jur ijnul</i>	pannus (superficial vascularization of the cornea), usually due to allergies, trachoma, and advanced glaucoma.
<i>purt</i>	hypophthalmus, a condition generally due to a trauma of the eye causing blood issue under the conjunctiva with (as a result) a bruised appearance.
<i>sapal</i>	the eye.
<i>tarfa</i>	literally, to burn the eye; any condition infection, trauma, or chemical aggression that gives a burning sensation in the eye when applied to it see <i>Ach'ats' borbos</i> .
<i>Ach'kn</i>	
<i>ayrel</i>	agent, condition, or process that shuts the eyelids.
<i>ijnogh</i>	
<i>kapel</i>	

<i>maz busnil</i>	see <i>Ach'k'i aweli maz ē busel</i> .
<i>mt'ts'nts'nel</i>	literally, obscuring the eyesight; the meaning may be literal (loss of eyesight or of visual acuity), or used figuratively, to mean loss of consciousness (syncope, fainting).
<i>mkhuats mis</i>	chemosis; see also <i>Ach'ats' mēj mis</i> .
<i>yirar kpch'il</i>	shutting of the eyelids as a result of an inflammatory condition; see also <i>Ach'kn kapel</i> .
<i>nazla ijnul</i>	see <i>Ach'ats' borbos</i> .
<i>shlogh</i>	causal agent of strabismus (cross-eyes).
<i>jur ijnul</i>	development of cataract in the eye.
<i>jur kamenal ijnul</i>	Probably, early signs of cataract.
<i>k'ashel</i>	to apply a collyrium to the eye.

**Table I**  
**“Meningitis” as described by ar-Râzî and Buniat‘ Sebastats‘i**

**As-sarsâm (meningitis)<sup>1</sup>**

The meningitis is cold or hot.

The bile or the blood may cause the hot meningitis.

The cold meningitis is due either to the lymphatic or the atrabiliary humors.

The signs of cold meningitis:

- Due to the blood: Persistent fever, redness of the eyes and the face, rounded pulse and swelling of the vessels in a florid patient without excessive blood.
- Due to the yellow bile: Intense fever with periods of delirium, but with less pronounced redness of the face and the eyes. The patient is lean.

The signs of cold meningitis:

- Fever of intermediate intensity, coma, white tongue, difficulty to maintain the eyelids open.

**Sarsamn (meningitis)<sup>2</sup>**

The meningitis can be of the cold variety (*norghish*), or the hot one (*gharaeanis*, “black affliction”).

There are two kinds of hot meningitis: One, atrabiliary; the other, atrabiliary mixed with a blood component.

- The signs of the mixed variety are: A red face red, the fever in accord with a long and rounded pulse, the veins are full, with photophobia, tearing eyes, a heavy head, senseless speech at sunset, and a heavy tongue.
- The atrabiliary signs are: High fever, sleeping difficulty, senseless speech; the mouth is dry and sour, and the tongue yellow and cracked.

There are two kinds of cold meningitis: One, atrabiliary; the other, phlegmatic.

- Atrabiliary signs are: Senseless speech at sunset, anxiety and weeping, insomnia, stupor, dry nasal mucous, head light-headedness, and fever.
- The phlegmatic signs are: Memory loss, sleep periods—during which rigor and fever set in—followed by awakening, the tongue white, the pulse sluggish, the mind wandering, and the speech incomprehensible.

<sup>1</sup> Abu Bakr Muhammad ben Zakaria ar-Râzî, *La division des maladies* (Aleppo, 1992), pp. 75-76.

<sup>2</sup> Buniat‘ Sebastats‘i, *Girk‘ bzhshkut‘ean (ZhE dar)* (Erevan: Haykakan SSH GA Hratarakch‘ut‘yun, 1987), pp. 60-61.

**Table 2. Ocular Signs/Symptoms Cited by Amirdovlat<sup>4</sup>**  
**Correlation with Common/Uncommon Eye Disease in 15th c. Anatolia**

Signs/Symptoms	N	(A)	(B)	(C)	(D)	(E)	(F)	(G)
Lens opacity	146						+	
Pain	48	+				+		
Ulceration	27	+	+	+				
Tearing	21	+	+			+	+	
Redness/Inflammation	18	+	+	+	+	+		
Itching	16	+					+	
Catarrhal discharge/Pus	3	+			+			
Pannus	2				+	+		
Burning sensation	1		+					+
Dryness	1	.						+

Abbreviations: N, number of citations by Amirdovlat<sup>4</sup> Amasiats*'i*; (A), bacterial or viral infection diseases; (B), Entropion/Ectropion (abnormal eyelid inversions); (C), Trachoma; (D), Glaucoma; (E), Allergy; (F) Cataract; and (G), Keratoconjunctivitis sicca (dryness of the cornea).

**Table 3. Eye Diseases Cited by Amirdovlat<sup>c</sup>**

Condition	Citations
Cataract	146
Entropion/Ectropion	14
Tumors	14
Stye	9
Trachoma	4
Paralysis	4
Xerophthalmia/Hemeralopia	2

The following diseases were each cited only once: Blepharitis, Chalazion, Ptosis, and Strabismus.

**Table 4. Frequencies of Eye Diseases Cited by Amirdovlat' (\*)**

Disease	N	F (%)
Cataract	146	22.5
Entropion/ectropion	14	2.2
Tumors (all etiologies)	14	2.2
Stye	9	1.4
Trachoma	4	0.6
Paralysis (all etiologies)	4	0.6
Night blindness	2	0.3
All other eye diseases		70.2
<b>Total (T)</b>		<b>100.0</b>

(\*) The frequency of each disease, relative to the total number of eye diseases, is the ratio of N (number of citations of that disease by Amirdovlat'), divided by the total number of all eye disease citations, which in this instance is equal to 648.

The frequency of “All other eye diseases” is equal to 100 minus the total of frequencies of all “identified” eye diseases, i.e., 70.2. The significance of this large number of the “All other eye diseases” category is clear: The fifteenth-century Anatolian populations suffered from a great variety of presently undiagnosed eye diseases.

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